Interactive non-immersiveVR and tourism destinations: the impact of technological traits on satisfaction and behavioral outcomes

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Abstract

Interactive non-immersive virtual reality (niVR) enables users to explore 3D environments, interact with information points, and control their visit's depth and pace, offering an experience similar to a real visit. Interest in such platforms is growing, yet tourism literature has largely examined individual applications by single tourist actors like hotels or museums, overlooking the perspective of tourism destination brands. This study addresses this gap by investigating which technological features affect user satisfaction and whether satisfaction influences behavioural outcomes. To this end, participants explored a tourism destination through an interactive niVR platform and completed a structured questionnaire. Findings contribute to tourism destination marketing literature by expanding knowledge on behavioural intentions elicited by virtual experiences. Practically, the results can support Destination Management Organizations (DMOs) in effectively integrating niVR into marketing strategies, highlighting features that enhance user satisfaction and engagement, thereby supporting more impactful digital promotion of tourism destinations.

Keywords: *interactive non-immersive virtual reality, tourism destination brand(ing), destination management organisation, satisfaction, behavioural intentions*

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1 Introduction

Over the past few decades, Virtual Reality (VR) has become a gradually significant and widespread technology, that has particularly shaken the tourism sector (Loureiro et al., 2020; Guttentag, 2010). In this context, the emergence of interactive non-immersive VR platforms has recently captured scholarly attention. Studies conducted so far have typically examined specific applications by single tourist actors (such as hotels, museums, theme parks and heritage sites), while a gap regarding the perspective of tourism destination brands remains. To the authors' knowledge, the only study addressing the role of interactive niVR from a more extended perspective is the work by Nam et al. (2023). However, the analysis focused on heritage and non-heritage sites rather than on the destination as a whole, and behavioural intentions were not taken into account.

Therefore, several questions remain unanswered in the perspective of tourism destinations, namely: (RQ1) Which factors elicit tourists' satisfaction in visiting and engaging with destinations through interactive niVR? (RQ2) How does satisfaction with interactive niVR destination experience influence tourists' behavioural intentions, such as continuance intention, willingness to recommend the virtual experience and intention to make a real travel to the destination? The present study was carried out to address these gaps of knowledge.

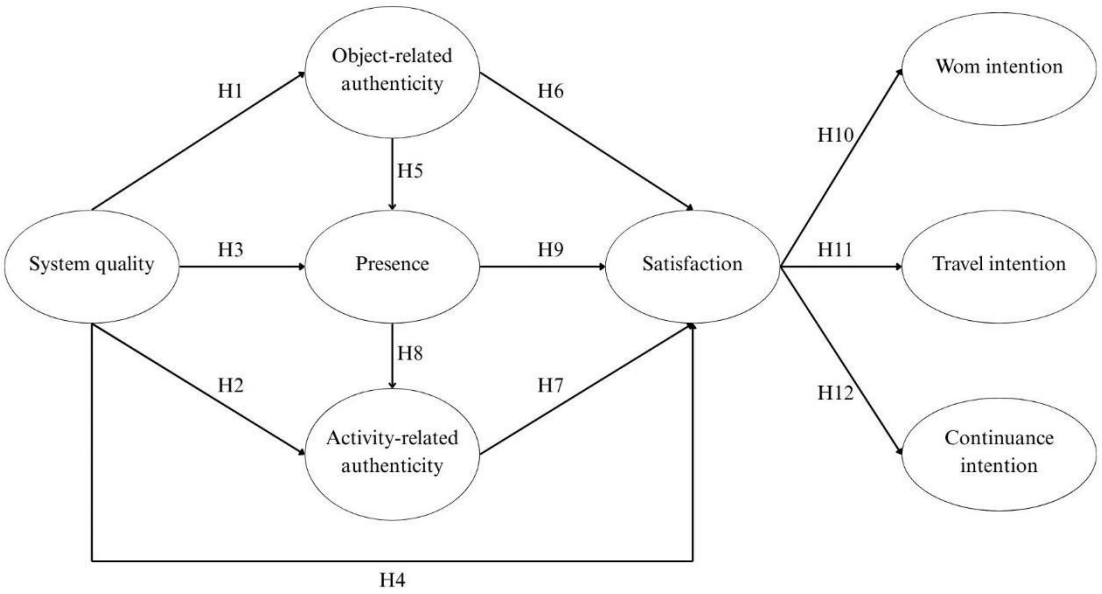
The research contributes to the tourism destination marketing literature by expanding existing knowledge on a range of behavioural intentions that interactive niVR technologies can elicit in potential tourists virtually experiencing the destination. While low-interactivity niVR experiences have been investigated in destination marketing literature (e.g. Rahimizihian et al., 2020), to the best of the authors' knowledge, this is the first empirical study to address the potential impact of interactive niVR experiences at a tourism destination level. In addition, the findings hold managerial value as they can support Destination Management Organisations (DMOs) in leveraging interactive niVR experiences to effectively promote the destination.

2 Literature review and hypotheses development

The present study builds on and expands the theoretical model proposed by Nam et al. (2023) to examine the impact of perceived system quality, presence and authenticity on visitor satisfaction when experiencing a tourism destination through interactive niVR. The study also examines the relationships between visitor satisfaction and multiple behavioural outcomes (i.e., word-of-mouth, travel, and continuance intentions). Figure 1 shows the conceptual model.

In line with Nam et al. (2023), authenticity is considered and measured as a construct consisting of two variables: a) object-related authenticity, that refers to the authenticity of objects, such as works of art, artefacts, and buildings and b) activity-related authenticity, that is a perception of genuineness in the tourists' feelings and experiences that emerges by engaging in tourist activities (e.g. Wang, 1999).

Figure 1 - Conceptual model



Source: Authors' own work

2.1 System quality

System quality is commonly defined in terms of a system's convenience, ease of use, flexibility, functionality and reliability (e.g., Tussyadiah et al., 2016). In the context of virtual tourism, it has been recognized as one of the main elements that affects the effectiveness of virtual environments in replicating aspects of reality (Guttentag, 2010). Therefore, it may have an influence on users' perception of authenticity of what they are interacting with (Nam et al., 2023).

Activity-related authenticity is experiential and depends on the feelings experienced by the tourist while involved in a tourist activity (Wang, 1999). As such, the system characteristics might influence users' perception of genuineness during an interactive niVR experience. This could translate in an improved perception of activity-related authenticity.

According to extant literature, the quality of a VR system is linked to the user's perceived sense of presence, such that the more sophisticated VR technologies are, the higher the degree of presence perceived by the user while using the system is (e.g. Beck et al., 2019).

System quality has also been identified as a key factor influencing user overall satisfaction of an experience (e.g. Tussyadiah et al., 2018). Thus, it is expected that the same relationship applies in the context of an interactive niVR destination experience.

The following hypotheses are stated:

H1. System quality is positively associated with object-related authenticity in interactive niVR destination experiences.

H2. System quality is positively associated with activity-related authenticity in interactive niVR destination experiences.

H3. System quality is positively associated with presence in interactive niVR destination experiences.

H4. System quality is positively associated with satisfaction in interactive niVR destination experiences.

2.2 Authenticity

Previous VR studies have demonstrated that a greater sense of presence is generated in the user when the scenario is perceived as authentic (e.g. Wei et al., 2019). Nam et al. (2023) demonstrated that object-related authenticity is positively associated with presence for both heritage and non-heritage sites experienced through interactive niVR. Based on these previous findings, the present study proposes the following hypothesis:

H5. Object-related authenticity is positively associated with presence in interactive niVR destination experiences.

While in the realm of heritage tourism real experiences it has been demonstrated that object-related authenticity impacts on perceptions of satisfaction (e.g. Lee et al., 2016), in the context of interactive niVR Nam et al. (2023) found that object-related authenticity was not a statistically significant predictor of satisfaction for heritage sites. It was, however, for non-heritage sites. In light of these mixed results, and since virtual reality aims to recreate real places and activities by suppressing elements that might signal the artificiality of the experience, the following hypothesis is proposed:

H6. Object-related authenticity is positively associated with satisfaction in interactive niVR destination experiences.

In their comparison of heritage and non-heritage sites experienced through interactive niVR, Nam et al. (2023) found mixed results with regards to activity-related authenticity and satisfaction: activity-related authenticity predicted satisfaction for heritage sites, but not for non-heritage sites. The authors themselves highlighted that these findings should be taken with caution and called for further investigations. In view of this, the hypothesis regarding niVR destination experiences is formulated in consistency with the results obtained in the majority of prior studies in tourism real experiences (e.g., Park et al., 2019). Specifically, the following hypothesis is stated:

H7. Activity-related authenticity is positively associated with satisfaction in interactive niVR destination experiences.

2.3 Presence

During a VR experience a sense of presence can be developed when the user doesn't feel the medium through which the experience is created and responds to it as if the medium was not there (Tussyadiah et al., 2018). Since activity-related authenticity depends on the feelings that a tourist has when he is involved in an experience, the following hypothesis is stated:

H8. Presence is positively associated with activity-related authenticity in interactive niVR destination experiences.

Presence is known to positively affect tourists' overall satisfaction when using VR technologies in multiple contexts, such as cultural heritage sites and museums (Chung et al., 2018) or theme parks (Wei et al., 2019). Despite the significant correlation mentioned above, there is still some uncertainty in the literature regarding this relationship. For instance, in Nam et al. (2023), presence does not directly determine niVR satisfaction. However, the authors themselves call for further investigations to better understand the specific role of presence with respect to different kinds of VR content. As such, the following hypothesis is stated:

H9. Presence is positively associated with satisfaction in interactive niVR destination experiences.

2.4 Behavioural intentions

The term “behavioural intention” (BI) refers to the set of behaviours that consumers intend to carry out after consuming a product or service. This research took into account three types of behavioural intentions: word-of-mouth (WOM) intention, travel intention, and continuance intention.

Tourism literature suggests that positive word-of-mouth communication is a consequence of tourist satisfaction (Wang et al., 2017). Previous studies on virtual tourism have shown that satisfaction experienced during a virtual experience can lead users to want to visit the destination (Kurnaz et al., 2024). “Continuance intention” refers to a user's expressed desire to continue using virtual reality technology (Leung et al., 2022) and recent studies have shown that satisfaction is a predictor of continuance intention regarding augmented reality technologies (Kim et al., 2016). Therefore, it is possible to assume that the same relationships occur in the case of interactive niVR experiences with tourism destinations. More formally, the following hypotheses are proposed:

H10. Satisfaction is positively associated with word-of-mouth intention in interactive niVR destination experiences.

H11. Satisfaction is positively associated with travel intention in interactive niVR destination experiences.

H12. Satisfaction is positively associated with continuance intention in interactive niVR destination experiences.

3 Methodology

Given the research objectives, participants in the study were asked to visit a tourism destination in an interactive niVR platform (https://www.procida2022vr.com). They were then asked to complete a structured questionnaire administered online. Table 1 shows the specific items and scales used in this research. The data collection started in June 2025 and ended in July 2025. At the end of the collection period, the number of valid responses was 245.

The study adopted the Partial Least Squares (PLS) method to perform an evaluation of the measurement model as well as the structural model. The structural model was examined by using the 5,000-bootstrap resampling procedure (Hair et al., 2017).

Table 1 - Measurement Items

Constructs	Measurement Items	Source – adapted from
System quality (SY_QUA)	I think the Procida22VR website is: - Easy to use - Fast - Convenient to use - Easy to navigate - Reliable	Kim & Hyun, 2016
Object-related authenticity (OB_AUT)	While visiting the Procida22VR website: - It looked like real - It was as accurate as the real attractions - It showed me the genuine features of the attractions - I was able to figure out the real features of the attractions - It accurately reproduced the real object virtually	Castéran & Roederer, 2013; Lin & Liu, 2018; Wu et al., 2019; Zhou et al., 2015

Presence (PRES)	While visiting the Procida22VR website: - I felt like that I have actually been there - It seemed as if I actually took part in sightseeing - It was as if my true location has shifted to the virtual environment - I felt as if I was physically present in the virtual environment.	Kang & Gretzel, 2012
Activity-related authenticity (AC_AUT)	While visiting the Procida22VR website: - I feel like I truly experienced these attractions - Watching the site made me connected to these attractions - I was immersed in the atmosphere of the attractions - I was able to escape from my daily life.	Kolar & Zabkar, 2010; Zhou et al., 2015
Satisfaction (SAT)	- I am satisfied with this non-immersive virtual tour experience - I feel enjoyable about this non-immersive virtual tour experience - I feel pleasant about this non-immersive virtual tour experience	Wong & Lai, 2021
Word of mouth intention (WOM)	- I would like to introduce the tourism-related VR activity to other people - I would like to recommend the tourism-related VR activity to other people - I would like to say positive words about the tourism-related VR activity to other people	Zhang, et al., 2017
Travel intention (TRAVEL)	- I would visit Procida in the future - I could see myself visiting Procida in the future - It is likely I would visit Procida in the future	McLean & Barhorst, 2022
Continuance intention (CONT)	- I intend to continue using the tourism-related VR activity rather than discontinue its use	Bhattacherjee, 2001

	- My intentions are to continue using the tourism-related VR activity than use any alternative means - If I could, I would like to continue using the tourism-related VR activity as much as possible	

Each item was measured on a seven-point Likert scale, anchored by 1= "strongly disagree" and 7= "strongly agree"
Source: Authors' own work

4 Results

4.1 Profile of the respondents

Table 2 presents the final sample profile. The survey respondents were mostly females (67.35%), aged under 30 (62.04%), with a bachelor's degree (39.18%), mostly students (44.08%), single (40.00%) or in a stable relationship (38.37%).

Table 2 - Profile of the respondents

Gender		*%*	*Occupation*		*%*
Female	165	67.35	Student	108	44.08
Male	80	32.65	Employed	84	34.29
Age			Executive/manager	8	3.27
18-30	152	62.04	Freelancer	23	9.39
31-40	34	13.88	Unemployed	7	2.86
41-50	19	7.76	Retired	8	3.27
51-60	25	10.20	Other	7	2.86
61-70	14	5.71	*Marital status*		
over 70	1	0.41	Single	98	40.00
Education			In a stable relationship	94	38.37
Middle school	14	5.71	Married	45	18.37
High school	70	28.57	Separated/divorced	6	2.45
Bachelor's degree (or equivalent)	96	39.18	Widowed/widow	2	0.82
Master's degree (or equivalent)	57	23.27	*First time using VR*		
PhD/Postgraduate education	7	2.86	Yes	128	52.24
Prefer not to say	1	0.41	No	117	47.76

Source: Authors' own work

4.2 Measurement assessment

Table 3 shows that all constructs satisfy the requirements of convergent validity, while table 4 shows that discriminant validity is satisfied. The model fit for the research model was assessed using SRMR and NFI indexes. The results revealed that the SRMR value was 0.081, close to the recommended value of 0.08 (e.g. Dash & Paul, 2021). The value of the NFI was

0.866, close to the recommended value of 0.90 (e.g. Dash & Paul, 2021). Thus, the model fit was confirmed.

Table 3 – CFA results

Constructs	Factor Loadings	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracted (AVE)
System quality (SY_QUA)		0.956	0.968	0.883
SY_QUA1	0.925			
SY_QUA2	0.934			
SY_QUA3	0.923			
SY_QUA4	0.942			
SY_QUA5	0.881			
Object-related authenticity (OB_AUT)		0.952	0.963	0.838
OB_AUT1	0.874			
OB_AUT2	0.910			
OB_AUT3	0.936			
OB_AUT4	0.919			
OB_AUT5	0.938			
Presence (PRES)		0.959	0.970	0.890
PRES1	0.942			
PRES2	0.956			
PRES3	0.934			
PRES4	0.941			
Activity-related authenticity (AC_AUT)		0.951	0.964	0.871
AC_AUT1	0.939			
AC_AUT2	0.944			
AC_AUT3	0.951			
AC_AUT4	0.898			
Satisfaction (SAT)		0.949	0.967	0.907
SAT1	0.954			
SAT2	0.934			
SAT3	0.969			
Word of mouth intention (WOM)		0.968	0.979	0.939
WOM1	0.973			
WOM2	0.979			
WOM3	0.955			
Travel intention (TRAVEL)		0.937	0.959	0.888
TRAVEL 1	0.948			
TRAVEL 2	0.950			
TRAVEL 3	0.927			
Continuance intention (CONT)		0.949	0.967	0.908
CONT1	0.949			

CONT2	0.952			
CONT3	0.956			

Source: Authors' own work

Table 4 - Discriminant validity test

	AC_AUT	CONT	OB_AUT	PRES	SAT	SY_QUA	TRAVEL	WOM
AC_AUT	**0.937**							
CONT	0.618	**0.953**						
OB_AUT	0.725	0.518	**0.916**					
PRES	0.905	0.599	0.734	**0.940**				
SAT	0.799	0.582	0.801	0.779	**0.951**			
SY_QUA	0.490	0.445	0.653	0.501	0.610	**0.936**		
TRAVEL	0.404	0.479	0.412	0.397	0.419	0.376	**0.940**	
WOM	0.671	0.711	0.510	0.655	0.645	0.455	0.500	**0.969**

Source: Authors' own work

4.3 Structural model assessment, mediating effects and control variables

Smart PLS was used to estimate the structural model. Table 5 shows the results of the direct effects and the decisions on the hypotheses. Subsequently, both mediations and serial mediations were verified. Table 6 shows the (significant) results of the indirect effects analysed.

In order to further verify the research model, socio-demographic information and pre-experience with VR were used as control variables of the relationship between satisfaction and WOM, travel and continuance intentions. They did not exert any significant influence on outcome variables.

Table 5 – Results of the direct effects

	Path	β	t-value	p-value	Decision
H1	SY_QUA-> OB_AUT	0.653***	13.119	0.000	Supported
H2	SY_QUA-> AC_AUT	0.048	1.598	0.110	Not supported
H3	SY_QUA-> PRES	0.038	0.568	0.570	Not supported
H4	SY_QUA-> SAT	0.135*	2.383	0.017	Supported
H5	OB_AUT-> PRES	0.709***	11.641	0.000	Supported
H6	OB_AUT-> SAT	0.365***	4.662	0.000	Supported
H7	AC_AUT-> SAT	0.365***	4.041	0.000	Supported
H8	PRES-> AC_AUT	0.881***	41.459	0.000	Supported
H9	PRES-> SAT	0.114	1.180	0.238	Not supported
H10	SAT-> WOM	0.644***	13.765	0.000	Supported
H11	SAT-> TRAVEL	0.399***	6.344	0.000	Supported

H12	SAT-> CONT	0.579***	11.832	0.000	Supported

*p < 0.05
**p < 0.01
***p < 0.001.
Source: Authors' own work

Table 6 - Results of the indirect effects

Path	Beta	t-value	p-value
SY_QUA -> SAT -> CONT	0.078	2.264	0.024
SY_QUA -> OB_AUT -> PRES	0.463	8.160	0.000
SY_QUA -> SAT -> TRAVEL	0.054	2.225	0.026
SY_QUA -> OB_AUT -> SAT	0.239	4.410	0.000
SY_QUA -> SAT -> WOM	0.087	2.329	0.020
SY_QUA -> OB_AUT -> SAT -> CONT	0.138	4.336	0.000
SY_QUA -> OB_AUT -> SAT -> TRAVEL	0.095	3.602	0.000
SY_QUA -> OB_AUT -> SAT -> WOM	0.154	4.339	0.000
SY_QUA -> OB_AUT -> PRES -> AC_AUT	0.408	7.931	0.000
SY_QUA -> OB_AUT -> PRES -> AC_AUT -> SAT	0.149	3.385	0.001
SY_QUA -> OB_AUT -> PRES -> AC_AUT -> SAT -> WOM	0.096	3.109	0.002
SY_QUA -> OB_AUT -> PRES -> AC_AUT -> SAT -> TRAVEL	0.059	2.778	0.005
SY_QUA -> OB_AUT -> PRES -> AC_AUT -> SAT -> CONT	0.086	3.041	0.002
OB_AUT -> PRES -> AC_AUT	0.625	10.799	0.000
OB_AUT -> SAT -> CONT	0.212	4.664	0.000
OB_AUT -> SAT -> TRAVEL	0.146	3.847	0.000
OB_AUT -> SAT -> WOM	0.235	4.645	0.000
OB_AUT -> PRES -> AC_AUT -> SAT	0.228	3.580	0.000
OB_AUT -> PRES -> AC_AUT -> SAT -> WOM	0.147	3.282	0.001

OB_AUT -> PRES -> AC_AUT -> SAT -> TRAVEL	0.091	2.937	0.003
OB_AUT -> PRES -> AC_AUT -> SAT -> CONT	0.132	3.212	0.001
PRES -> AC_AUT -> SAT	0.321	3.963	0.000
PRES -> AC_AUT -> SAT -> CONT	0.186	3.573	0.000
PRES -> AC_AUT -> SAT -> TRAVEL	0.128	3.165	0.002
PRES -> AC_AUT -> SAT -> WOM	0.207	3.610	0.000
AC_AUT -> SAT -> CONT	0.211	3.647	0.000
AC_AUT -> SAT -> TRAVEL	0.146	3.223	0.001
AC_AUT -> SAT -> WOM	0.235	3.680	0.000

Source: Authors' own work

4.4 Summary of results

The results of the study confirm some of the relationships already observed in previous research, while presenting some discrepancies with previous literature.

Specifically, the study confirms the findings of Nam et al. (2023), highlighting both the significant and positive relationship between system quality and object-related authenticity, and that there is no relationship between system quality and activity-related authenticity; system quality also appears to be significantly linked to satisfaction. Moreover, analyses show that object-related authenticity and activity-related authenticity are two fundamental elements in defining satisfaction. Furthermore, analyses show that object-related authenticity affects users' sense of presence. Contrary to the findings of Nam et al. (2023), the results of this study suggest that the sense of presence experienced by users does not depend on system quality. In terms of presence, this study confirms its relationship with activity-related authenticity: as individuals' sense of presence during an interactive niVR experience increases, so does their sense of authenticity with regard to the experience itself. Consistently with Nam et al. (2023) the study found that when users experience tourism destinations through interactive niVR, satisfaction is not directly dependent on presence. The study also demonstrates that satisfaction directly and positively determines all three behavioural intentions, namely word-of-mouth, travel, and continuance intention. The results confirm that some of the relationships already observed in related tourism fields, including cultural heritage, hospitality, and the museum sector (Kurnaz et al., 2024; Atzeni et al., 2022; Wang et al., 2017), also apply in the case of an interactive niVR destination experience.

5 Discussion and conclusion

In recent years, interactive niVR has become increasingly popular in the tourism sector, as it offers new and challenging ways to enjoy tourism, affecting both the demand and supply side of the industry. In this context, the present paper restores attention to the perspective of tourism destination brands, verifying how concepts such as system quality, authenticity,

presence, satisfaction and the three behavioural outcomes of WOM, travel and continuance intention are related when a destination is experienced through this technology.

This study confirms that authenticity (both object- and activity-related) is fundamental even when entire tourist destinations are experienced through interactive niVR. It also demonstrates that the sense of presence perceived by users during their interactive niVR experiences with the tourism destination does not directly affect their overall satisfaction with the experience. This result is consistent with that of Nam et al. (2023), but it challenges the majority of existing tourism literature, highlighting the need for further studies analysing this relationship in different contexts and through different technological systems. Finally, this paper demonstrates the pivotal role of user satisfaction during interactive niVR experiences in driving users' behavioural intentions (namely, WOM, travel and continuance intention), in line with the literature on tourism and virtual tourism (e.g. Kurnaz et al., 2024).

From a managerial standpoint, this study's findings are significant for DMOs who intend to incorporate VR experiences into their marketing efforts. The results of the study are therefore helpful as they demonstrate that: a) introducing these technologies can stimulate potential tourists to actually visit the tourism destination; b) the experience is so satisfying that users intend to use it again; and c) users want to recommend the experience to friends and relatives, thus increasing its reach and the possibility that others will become interested in visiting the destination. The study also shows that both object-related and activity-related authenticity are fundamental to shaping tourist satisfaction and helps to understand which elements DMOs should focus on when implementing interactive niVR experiences. It is also valuable remembering that, when interactive niVR experiences are created by a tourism destination brand, presenting a diverse array of sites and attractions is relevant to provide users with a nuanced experience of the destination in all its complexity. The importance of collaboration between policymakers, destination marketers, tourism stakeholders in the destination's success becomes evident.

6.3 Limitations and future research

Like all empirical research, this study is not without limitations which point to areas for future research on topics of interest to both academics and DMO professionals.

The first set of limitations is related to the research sample. Convenience sampling was used in the present study. However, the study only involved Italian respondents, thus precluding generalizability of results. Second, since the present research considered the use of interactive niVR, future studies could examine both immersive and non-immersive platforms, in order to understand whether the relationships between variables in the research model change based on the type of technology used. Third, the conceptual model did not consider additional variables as predictors or consequences, which could be interesting to understand in future research.

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